NASA MARS SURVEYOR PROGRAM 2001 MISSION

R. S. Saunders (Jet Propulsion Laboratory, California Institute of Technology, Mail Stop 183-335, 4800 Oak Grove Drive, Pasadena, CA 91109, USA)

The Mars Surveyor Program 2001 mission to Mars is a pivotal mission. It completes the Mars Observer objectives with the gamma ray spectrometer mapping. Except for some specific orbital observations that will be needed to locate subsurface water and further localized characterization of mineralogy or morphology, this mission will largely complete the global characterization phase of Mars exploration and mark the beginning of focused surface exploration leading to return of the first samples and the search for evidence of past martian life. MSP'01 also is the first mission in the combined Mars exploration strategy of the Human Exploration and Development of Space (HEDS) and Space Science Enterprises of NASA. The mission, and those to follow, will demonstrate technologies and collect environmental data that will provide the basis for a decision to send humans to Mars. The NASA exploration strategy for Mars includes orbiters landers and rovers launched in 2001 and 2003 and a sample return mission to be launched in 2005, returning a sample by 2008. The purpose of the rovers is to explore and characterize sites on Mars and select rocks, soil and atmosphere for return to Earth. Potential sites include ancient subsurface hydrothermal environments excavated by recent impacts, and ancient channels and lakes. The 2001 orbiter carries a gamma ray spectrometer that will provide a global elemental map of Mars. The GRS experiment completes the suite of global observations that was lost with Mars Observer. Also, the orbiter carries a thermal emission spectrometer (THEMIS) and imager that will map the mineral abundance at selected sites and a radiation experiment, Marie, to assess radiation hazards to humans. The rover is similar to the 1997 Pathfinder Sojourner rover, with an upgraded Alpha Proton X-ray Spectrometer (APXS) experiment that will be carefully calibrated under Martian conditions on Earth, and again on Mars shortly after landing. The APXS will perform elemental analysis on rock and soil samples for all elements except H and He. The rover cameras will also be calibrated. The lander carries a suite of Space Science and HEDS instruments including a robotic arm with camera. The arm will deploy a Moessbauer spectrometer to determine the oxidation state of iron in the soil or rocks. The arm will be used to deploy the rover and dig to a depth of up to 0.5 m to deliver soil to the Mars Environmental Compatibility Assessment Experiment (MECA), the soil and dust characterization experiments. The Mars In Situ Propellant Precursor Experiment (MIP) will perform experiments to assess technology needs for in situ propellant production and produce oxygen from the Martian atmosphere. The Marie counterpart to the orbital radiation experiment will allow assessment of how the radiation hazards on the surface might be mitigated by the atmosphere or other factors. The lander will carry a panoramic camera bore-sighted with a thermal emission spectrometer (PanCam/MiniTES). This combination will provide guidance to the rover and allow comparison between the mineralogical data from MiniTES and the elemental data from the APXS. Finally, the lander will carry a descent imaging system (MARDI) that will provide nested images from parachute deployment down to the surface. The basic flight systems for the orbiter and lander use MSP'98 heritage. There will be extensive outreach activities using the rover and the robotic arm. Students all over the world will participate in Red Rover Goes to Mars, a program that will be carried out by the Planetary Society in cooperation with the Project and science teams.